WHAT IS CLAIMED IS:

1. A method of increasing the efficiency of transformation of cycling cells, said method comprising:

synchronizing cells at a first stage of the cell cycle, and

transforming said cells at a second stage of the cell cycle within about one cell cycle of said first stage with a nucleic acid that encodes a desired gene product.

2. A method of claim 1 wherein cells are synchronized by contacting said cells with an amount of a cell cycle synchronizer that is effective to synchronize cells at said first stage of the cell cycle.

3. A method of claim 2 wherein said cell cycle synchronizer synchronizes cells at a stage of the cell cycle when the nuclear membrane is substantially degraded.

4. A method of claim 1 wherein said cell cycle synchronizer synchronizes cells at late S phase.

5. A method of claim 1 wherein said cell cycle synchronizer synchronizes cells at the G_2/M phase boundary.

6. A method of claim 1 wherein said cell cycle synchronizer synchronizes cells at a stage other than M phase, and the nucleic acid accumulates in cells that have cycled to the G_2/M phase boundary.

7. The method of claim 1 wherein said cell cycle synchronizer is a vinca alkaloid.

8. The method of claim 1 wherein said cell cycle synchronizer is cisplatin.

9. The method of claim 1 wherein said cell cycle synchronizer is selected from the group consisting of taxol and taxolene.

10. A method of claim 1 wherein said first stage and said second stage are the same.

11. A method of claim 1 wherein said nucleic acid encodes a therapeutic gene and said therapeutic gene is foreign to the cell.

12. A method of claim 11 wherein the gene product of the therapeutic gene is toxic to the cell.

13. A method of claim 12 wherein the gene product of the therapeutic gene induces apoptosis.

14. A method of claim 1 wherein the nucleic acid is part of a lipid-nucleic acid particle.

15. A method of inhibiting the growth of cancer cells, said method comprising:

administering to a cancer patient an amount of a cell cycle synchronizer that is effective to synchronize cancer cells of said patient at a first stage of the cell cycle; and

administering to said cancer patient a nucleic acid that transforms cancer cells of said patient;

wherein the expression of said nucleic acid inhibits the growth of said cancer cells.

16. A method of claim 15 wherein said cancer cells are synchronized at a stage when the nuclear membrane is substantially degraded.

17. A method of claim 15 wherein said cell cycle synchronizer synchronizes the cell cycle at late S phase.

18. A method of claim 15 wherein said cell cycle synchronizer synchronizes the cell cycle at the G_2/M interphase.

19. A method of claim 15 wherein said cell cycle synchronizer synchronizes the cell cycle at a stage other than M phase, and the nucleic acid accumulates in cells when a plurality of cells exposed to the agent have cycled to the G_2/M interphase.

20. A method of claim 15 wherein said cell cycle synchronizer is a vinca alkaloid.

21. A method of claim 15 wherein said cell cycle synchronizer is cisplatin.

22. A method of claim 15 wherein said cell cycle synchronizer is selected from the group consisting of taxol and taxolene.

23. A method of claim 15 wherein said first stage and said second stage are the same stage of the cell cycle.

24. A method of claim 15 wherein said nucleic acid encodes a therapeutic gene.

25. A method of claim 24 wherein the therapeutic gene is foreign to the patient.

26. A method of claim 25 wherein the gene product of the therapeutic gene is toxic to said cells.

27. A method of claim 26 wherein the gene product of the therapeutic gene induces apoptosis of said cells.

28. A method of claim 15 wherein the nucleic acid is part of a lipid-nucleic acid particle.

29. A method of claim 15 wherein the nucleic acid is administered systemically.

30. A method of claim 24 wherein the therapeutic gene is expressed in said cancer cells.

31. A method of claim 30 wherein the therapeutic gene is HSV-TK and ganciclovir is also administered to said cancer patient.

32. A method of claim 15 wherein said cell cycle synchronizer is administered prior to administering said nucleic acid.

33. A method of claim 31 wherein said cell cycle synchronizer is administered at least 32 h prior to administering said nucleic acid.

34. A method of claim 31 wherein said cell cycle synchronizer is administered at least 48 h prior to administering said nucleic acid.

35. A method of claim 15 wherein said nucleic cid is administered prior to administering said cell cycle synchronizer.

36. A method of claim 15 wherein said nucleic acid is administered at least 32 h prior to administering said cell cycle synchronizer.

37. A method of claim 15 wherein said nucleic acid is administered at least 48 h prior to administering said cell cycle synchronizer.

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38. A method of enhancing the therapeutic effect of a ~~foreign~~ therapeutic gene administered to a patient, ~~said method~~ comprising the steps of

(a) administering a cell cycle blocking agent to said patient; and

(b) administering said foreign therapeutic gene to said patient within seven days of step (a).

39. The method of claim 38 wherein step (b) is performed within 3 days of step (a)

40. The method of claim 38 wherein step (b) is performed within 24 hours of step (a).

41. The method of claim 38 wherein said foreign therapeutic gene is a plasmid.

42. The method of claim 38 wherein said foreign therapeutic gene comprises a gene selected from the group consisting of genes encoding a cytokine, apoptotic protein, tumor suppressor, heat shock protein, immunogenic antigen, proteinase inhibitor, anti-angiogenic protein, suicide gene for use in GDEPT, ribozyme, antisense nucleic acid, viral protein and a toxin.

43. The method of claim 38 wherein said foreign therapeutic gene is administered systemically.

44. The method of claim 38 wherein said foreign therapeutic gene is administered locally or regionally.

45. The method of claim 38 wherein said foreign therapeutic gene is fully encapsulated in a lipid formulation such that less than 5% of the gene is degraded after exposure of said formulation to 1 U DNAse I for 30 minutes in digestion buffer at 37°C.

46. The method of claim 38 wherein said cell cycle blocking agent is selected from the group consisting of DNA alkylating agents, DNA topoisomerase inhibitors, microtubule assembly inhibitors, microtuble disassembly inhibitors, DNA-cross linking agents, DNA-binding agents and nucleoside analogues.

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47. The method of claim 38 wherein said cell cycle blocking agent is selected from the group consisting of cyclophosphamide, etoposide, taxol, vincristine, cisplatin, doxorubicin and 5-fluorouracil.

48. The method of claim 38 wherein said cell cycle blocking agent is in a liposome formulation.

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49. A method of claim 38 wherein said cell cycle blocking agent is administered prior to administering said foreign therapeutic gene.

50. A method of claim 38 wherein said cell cycle blocking agent is administered at least 32 h prior to administering said foreign therapeutic gene.

51. A method of claim 38 wherein said cell cycle blocking agent is administered at least 48 h prior to administering said foreign therapeutic gene.

52. A method of claim 38 wherein said foreign therapeutic gene is administered prior to administering said cell cycle blocking agent.

53. A method of claim 38 wherein said foreign therapeutic gene is administered at least 32 h prior to administering said cell cycle blocking agent.

54. A method of claim 38 wherein said foreign therapeutic gene is administered at least 48 h prior to administering said cell cycle blocking agent.

sub C2

55. A method of enhancing the therapeutic effect of a cell cycle blocking agent, or of lowering the dosage of a cell cycle blocking agent required for a therapeutic effect, administered to a patient comprising the steps of: (a) administering said cell cycle blocking agent to a patient; and (b) administering a foreign therapeutic gene to said patient within seven days of step (a).

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